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HEALTH IS A STATE OF COMPLETE PHYSICAL, MENTAL, AND SOCIAL WELLBEING AND NOT MERELY THE ABSENCE OF DISEASE OR INFIRMITY

— *WORLD HEALTH ORGANISATION*

Vol. III, No. 2 June 1956.

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NATIONAL FILARIA CONTROL PROGRAMME

BY

N. G. S. Raghavan (Malaria Institute of India)

(*17th October* 1955).

[From ' Bulletin of the National Society of India for Malaria and other Mosquito-borne diseases', Volume III, No. 6, November 1955, pages 175 to 184.]

FILARIASIS has been reported in India from ancient times (Susruta, 6th Century B.C.). More recently Clarke (1709) described the presence of elephantoid legs, in Cochin as " Malabar Leg ". In spite of its ancient history no country-wide survey has been carried out to determine the extent of prevalence, types of infection or the vectors, chiefly due to negligible mortality caused by this disease. Megaw and Gupta (1927) were the first to publish a filaria map of India, showing a very patchy distribution of this disease. Workers at the King Institute, Guindy, Madras, have been carrying out studies in the field of immunity. At the School of Tropical Medicine, Calcutta, studies in Chemotherapy of filariasis have been carried out in addition to studied on the morphology of the parasite. Since 1930, the Indian Research Fund Association (now Indian Council of Medical Research), has been interested in the study of filariasis and its control. Small scale filaria surveys were carried out by V. T. Korke, and later on by S. S. Rao. Iyengar (1938) made a detailed study of the epidomiology of filariasis in Travancore, mainly a *W. malayi* area.

From replies received to a questionnaire submitted by the Malaria Institute of India, in 1951, and other reports, the infection has been observed to be prevalent in Andhra, Assam, Bihar, Bombay, Hyderabad, Madhya Pradesh, Madras, Orissa, Saurashtra, Travancore-Cochin, Uttar Pradesh, Vindhya Pradesh and West Bengal States. Recently foci have been reported from Nicobars and some of the French Settlements acceeded to India. At least, 25 million persons are reported to be living in the endemic areas. As a mosquito-borne disease, it is second only to malaria as a public health problem in India.

So far, only two types of filarial infection, *W. malayi* and *W. bancrofti*, have been recorded in this country. The former is transmitted by *Mansonioides sp.* and the latter by *C. fatigans*. *C. fatigans* breed in dirty water collections like cess-pits, drains, etc., while *Mansonioides sp.* can breed only in association with certain aquatic vegetation, chiefly *pistia stratiotes* to the rootlets of which the larvæ and pupæ attach themselves and thus derive air for respiration.

The need for a study of the different aspects of the disease, its impact on the economic welfare and social development of communities, have been felt by many workers and organizations in different parts of the world including India. The Health Survey and Development Committee of the Government of India (1946) drew attention to the prevalence of infection in the various parts of India and lack of efficient remedies against this infection. This has been aptly summarized by this Committee as follows: " Which has remained so far a challenge to workers in tropical medicine." An optimistic note has also been added that "in view of the remarkable results that modern scientfic development has been able to achieve in the treatment of various diseases, there is every reason to hope that a cure will be found for filariasis " and that the only effective measures against the disease " known at present are those which are concerned with the control of carrier species of mosquitoes."

The World Health Organization at its First Assembly in alloting priorities for the control of various diseases of Public Health importance took cognizance of this infection also. Being of secondary importance to malaria as a public health risk, control of filariasis was allotted a second priority.

While the above bodies recognized the importance of the infection, the real fillip to greater and more intensive study of the different aspects of filariasis has been due to three factors. The first was the discovery of a suitable experimental animal, i.e., the cotton rat, *Sigmodon hispidus*, in the eastern and southern parts of United States of America, with a naturally occurring filarial infection *Litosomoides carinii*, which could be experimentally transmitted by the tropical mite *Bdellonyssus bacoti*. The second one was due to the American soldiers acquiring filarial infection in the Pacific theatre during World War II, which set the research machinery in United States of America into activity and finally led to the production of a potent filaricide, diethylcarbamazine, which has a specific effect on the microfilariæ in the human host. In addition, due to necessity during the war, potent insecticides were also synthesised.

Control of filariasis in the past consisted mainly of antilarval measures, i.e., cleaning of *kucha* or masonry drains, clearing catch pits or draining off of small collections of water, once a week. Later, oil was used as a larvicide in addition to the above. Subsequently these were reinforced with pyrethrum spray as an imagocide with temporary results. All these measures were being carried out by State Governments on a small scale, more for control of mosquito nuisance than filaria control *per se*. The advent of the synthetic insecticides and their use in malaria control has made available comparable knowledge in the control of the vectors of filariasis as well. Oil fortified with insecticide to be used as a larvicide took its place in many areas in lieu of oil itself. Some State Governments made grants-in-aid to local bodies to carry anti-mosquito measures as a fillip to control of filariasis. Though these measures were effective to a degree in controlling the mosquitoes and thus reducing reinfection yet they had no effect against the reservoir of infection already acquired by the community.

With the availability of the recently synthesised filariacide, small scale studies in the control of filariasis by its use was started in different places in the world including India. The Indian Council of Medical Research in conjunction with the Government of Orissa sponsored a scheme for control of *W. bancrofti* infection in Orissa and the work was carried out under the Director, Malaria Institute of India. The object was to test the efficacy of anti-larval or anti-adult measures against *C. fatigans* as against mass therapy with diethylcarbamazine in the control of bancroftian filariasis. Following preliminary studies, mass therapy was carried out in a selected area with a dose of 2 mg/kg twice daily for five days. The anti-larval measures, in a comparable area, consisted of weekly application of DDT one per cent in malariol to the breeding places. The imagocidal measure, in yet another comparable area, consisted of DDT residual spraying (100 or 200 mg/sq.ft.) indoors of houses and cattle-sheds. A comparison area was also maintained for interpretation of results of this study.

The results obtained in these studies as reported to the Indian Council of Medical Research are as follows :—

(*a*) Mass therapy in the dose schedule adopted, kept the infection in the community under control for at least two years following the single course of therapy of diethylcarbamazine.

(*b*) Anti-larval measures produced a 22·2 per cent drop in the infection rate in the first two years after control and after four years of control the reduction noted was 26·9 per cent only.

(*c*) Anti-adult measures produced a reduction of 28·6 per cent in the infection rate after four years of control.

(*d*) There was no natural decline of filarial infection in the comparison area.

The above results were in conformity with results of similar work carried out in other parts of the world. The life of the adult filarial worms has been noted to be between five and seven years. Thus anti-mosquito measures would have to be carried out for over five years. The practical difficulties in such measures are considerable. Mass therapy by itself cannot be considered as a single method of control due to the practical difficulty to cover the whole community, the lack of effect against established disease processes and the reactions in symptomless persons. Due to the above practical difficulties in the use of any of these methods individually, it is felt a combination of these methods, i.e., a single course of mass therapy in all areas, with recurrent anti-larval measures and a single round of insecticidal application at the peak season of mosquitoes in the urban areas and three rounds of insecticidal application only in rural areas, would produce palpable results in a reasonable time in the control of filariasis.

As a step towards effectively tackling the problem in India, the Filariasis Advisory Committee of the Indian Council of Medical Research resolved at its annual meeting in Gwalior in November 1953; " recognizing the immensity of the filariasis problem in so far as it is known and the socio-economic ills resulting therefrom, the urgent need for demonstration of control measures, surveys, training of personnel in the various filarious states for combating the infection on a nation-wide scale, the Committee recommended that pilot units be established in each State for survey and control of filariasis and that a final plan for the control of filarial infection on a nation-wide scale be drawn up for consideration for inclusion in the Second Five-Year Plan ". This was accepted by the Scientific Advisory Board of the Indian Council of Medical Research and recommended to the Government of India. The Ministry of Health, Government of India, thereafter submitted a comprehensive programme drafted by the Director, Malaria Institute of India, which was recommended for consideration by the Planning Commission in reference to Technical Co-operative Mission Aid.

The present phase of the programme envisages—

(*a*) Delimitation of the filariasis problem in the country by the establishment of 22 survey units in the States where filariasis has been reported. The number of such survey units to be established in each of the States is dependent on the anticipated size of the problem.

(*b*) Carrying out pilot demonstration of filariasis control in each of the States where filariasis has been reported. The method of control is to be a combination of mass therapy with diethylcarbamazine in a dose of 4 mg/kg single daily dose for five days in all areas and recurrent weekly anti-larval control as also a round of insecticidal spraying at the peak season of mosquito prevalence in urban areas and three rounds of insecticidal application only in rural areas.

(*c*) To expand the facilites at the Malaria Institute of India to train the personnel to be engaged in such activities as mentioned before by the State organizations.

(*d*) To provide engineering advisory facilities to the State Governments to prevent man-made mosquitogenic conditions.

(*e*) To arrange for procurement of equipment and supplies, maintenance of central stores, preparation of propaganda material for health, education, evolution of results, maintenance of liasion with the State and international organizations connected with filariasis control. The above [except for (*a*) and (*b*)] are to be carried out by Malaria Institute of India.

The first phase of the programme is now being implemented.

Financing of the project will be the joint responsibility of the Central and State Governments with the assistance of the Technical Co-operation Mission. Material and equipment required for survey and control units will be provided free to the State Governments and in addition grants-in-aid are to be made towards custom duty on dieldrin and hetrazan to be imported. The State Governments will bear all operational and other costs of the programme.

The draft programme was circulated to all the States where filaria was known to be prevalent. With the exception of the Government of Assam, all the other States have agreed to participate. Thirteen control and 22 survey units, to be formed in the financial year 1955–56, have been allotted as per details given below :—

Name of State.	Control unit.	Survey unit.
Andhra	1	2
Bihar	2	2
Bombay	1	..
Hyderabad	1	1
Madhya Pradesh ..	1	1
Madras	1	2
Orissa	1	4
Saurashtra	1	1
Travancore-Cochin ..	1	2
Uttar Pradesh ..	1	3
Vindhya Pradesh ..	1	1
West Bengal ..	1	3
	13	22

(A modified unit is to be allotted for Andaman-Nicobars. The problem in French Settlements acceeded to India is likely to be brought within the scope of the programme.)

Each control unit is to cover approximately 300,000 persons living in endemic areas and will cost Rs. 4,65,400 during the year 1955–56, of which Rs. 2,48,000 is to be contributed by the Technical Co-operation Mission, Rs. 1,12,000 by the Government of India and Rs. 1,05,400 by the State Governments. Details are set out in Appendix I. Each survey unit will cost Rs. 38,300 of which the State Governments' share will be Rs. 27,300 (vide details in Appendix II). Each survey unit is expected to carry out a rapid filaria survey covering a population of about 800,000 in two years.

The staff required for each control and survey unit has been indicated in Appendix III. The financial implication of the programme is as follows :—

Total cost during the year 1955–56.

	RS.
1 Cost of 13 control units ..	60,50,200
2 Cost of 22 survey units	8,42,600
3 Expansion of Filaria Section at the Malaria Institute of India.	1,38,500
	70,31,300

Share of expenditure between various Agencies.

	RS.
1 Technical Co-operation Mission assistance.	34,47,500
2 Government of India ..	16,13,000
3 State Governments	19,70,800
	70,31,300

Friday, 25th March 1955, will be remembered as a landmark in the history of filariasis in India. On that day the Indo-United States Agreement was signed between India and the United States of America. With this agreement it would be possible at least to launch the first phase of a nation-wide control of filaria stipulated to provide protection to nearly four million of the people living in filarious areas of the country during the year 1955–56.

APPENDIX I.

COST OF A CONTROL UNIT.

Item.	Technical Co-operation mission share.	Government of India share.	State Government share.
(1)	(2)	(3)	(4)
	RS.	RS.	RS.
I Salaries of staff	..	..	28,400
II Travelling charges	..	..	4,500
III Other charges—			
1 3·9 million tablets of diethylcarbamazine (50 mg. each).	1,56,000	..	..
2 5·4 tons of dieldrin 50 per cent w.w.p. ..	68,000	..	..
3 Twelve compression sprayers	1,200	..	..
4 Two power sprayers	1,800	..	..
5 One station wagon	11,500	..	..
6 One jeep	7,900	..	..
7 One microscope	1,800	..	..
8 Twenty-five stirrup pumps	..	2,500	..
9 One jeep trailer	..	1,500	..
10 Fifteen tons of BHC 50 per cent w,w.p. ..	..	27,000	..
11 Customs duty on diethylcarbamazine tablets and dieldrin (grant-in-aid).	..	81,000	..
12 Wages of 20 field workers at Rs. 45 per mensem and 110 field workers at Rs. 40 per mensem (for about four months).	..	..	20,000
13 Customs duty on station wagon, jeep and microscope.	..	..	13,000
14 Assembly charges of vehicles	..	..	6,000
15 Miscellaneou—			
(i) Cost of twelve cycles and accessories ..	..	..	3,000
(ii) Transportation charges of insecticides, etc.	..	..	2,500
(iii) Labour to be engaged for distribution of drug.	..	..	12,500
(iv) Repairing charges of vehicles and maintenance of other equipment.	..	..	6,000
(v) Petty purchases	..	..	9,000
Total ..	2,48,000	1,12,000	1,05,400

APPENDIX II.

COST OF A SURVEY UNIT.

Item. (1)	Technical Co-operation mission share. (2)	Government of India share. (3)	State Government share. (4)
	RS.	RS.	RS.
I Salaries of staff	..	..	12,200
II Travelling allowance	..	..	3,500
III Other charges—			
1 One microscope	1,800	..	..
2 One jeep	7,700	..	..
3 Customs duty on jeep	..	..	4,900
4 Customs duty on microscope	..	..	700
5 Assembly charges of jeep	..	..	1,500
6 One jeep trailer	..	1,500	..
7 Miscellaneous	..	..	4,500
Total ..	9,500	1,500	27,300

APPENDIX III.

STAFF FOR EACH CONTROL UNIT.

One Filaria Officer.
One Research Officer.
One Assistant Entomologist.
Two Filaria Inspectors.
One Stenographer.
One Upper Division Clerk.
Four Insect Collectors.
Two Driver (*cum*) Mechanics.
One Chowkidar.

STAFF FOR EACH SURVEY UNIT.

One Filaria Officer.
One Laboratory Assistant.
Two Insect Collectors.
Two Laboratory Attendants.
One Driver *cum* Mechanic.
One Watchman.

SMOKELESS COOKING OVEN.

(Reproduced from the pamphlet " Magan Choola ", published by the Manager, Gandhiniketan Ashram, T. Kallupatti, Madurai district, 1955.)

Preface.

We are glad to bring out a pamphlet on " Magan choola " for which there is a great demand now-a-days. This choola, though originally devised by the All-India Village Industries Association, Maganwadi, Wardha, has gone into many improvements at this institution.

It is portable. No technical expert is needed for its manufacture. Any ordinary potter can easily manufacture this choola with the locally available mud, provided he once observes the various processes adopted here. The introduction of this choola will provide full-time employment to village potters when they could supply them to surrounding villages throughout the year. Hence, this solves unemployment problem of the potter to a larger extent.

The other important feature of this choola is that it relieves women from eye and heart ache due to smoke in the kitchen and thus saves them from unnecessary medical treatment. It also keeps the kitchen clean and tidy if only the women can utilize this choola carefully. A woman handling this choola intelligently can save half the fuel consumption. It is really a boon to womenfolk.

The introduction of this choola widely, will provide labour to village potters, help women to live hygienically and save afforestation to a great extent. We believe that those interested in the welfare of the nation, will certainly give wide publicity to this and thus aid the causes it stands for.

GANDHINIKETAN ASHRAM,
10*th May* 1955.

R. GURUSAMY,
Manager.

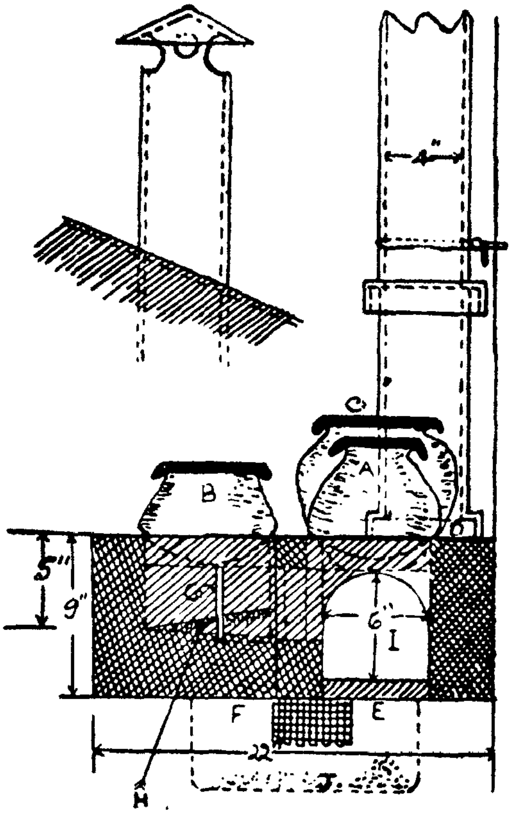


FIGURE 5.

A to G same as explained in figure 6.

H. Baffle projection to raise flames nearer the vessel.

I. Fuel entrance.

J. Ash pit.

K. Cowl (chimney) above the roof.

L. Roof.

M. Nail in wall to fasten chimney by wire.

Cooking on maganchoola becomes cheerful.

THE MAGAN CHOOLA

(Smokeless Cooking Oven)

It is strange that until some time past, the ovens which occupy a key position in our family life had not been given due investigation. It is roughly calculated that more than 50 million ovens are lit everyday in our country and a majority of our women give a great part of their time in the kitchen. The ovens that most of us use are country-made and have a great deal of defects in them due to the ill-equipped and unqualified skill applied in their making; the main defects being the problem of smoke which injures the eyes and hearts of our women, wastage of heat, excessive consumption of fuel and the inefficient performance of the entire equipment.

No research to remedy these defects was made until it attracted the attention of the Hyderabad Engineering Research Laboratories, which conducted some work in the direction of controlled combustion. Observing these experiments carefully, the All-India Village Industries Association, Maganwadi, Wardha, proceeded further investigation to evolve a smoke-free and at the same time efficient and village-made oven and arrived at the Magan Choola.

Experiments, in the light of the above findings, to further improve the 'Choola' were also conducted at the pottery section of the Gandhiniketan Ashram, T. Kalluppatti, the results of which enabled us to prepare and propagate a more-improved and portable type of oven. Training in the preparation and use of such ovens is also being given to a large number of students.

The few pages that follow will give an account of the preparation and utility of the Magan Choola.

The country oven and its defects.

The country oven which is used in almost all houses consists of a 9 inches high semi-cylindrical wall with three projections to

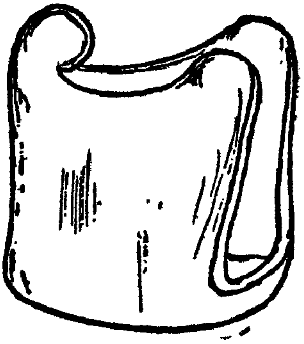


FIGURE 1.
Single country oven.

support the vessel on it (see figure 1). In some places, an extension of the one side wall is made to provide another pot-seat, thus making it a little more efficient in the utilisation of heat [see figures 1 (*a*) and 1 (*b*). *But* these have the following defects :—

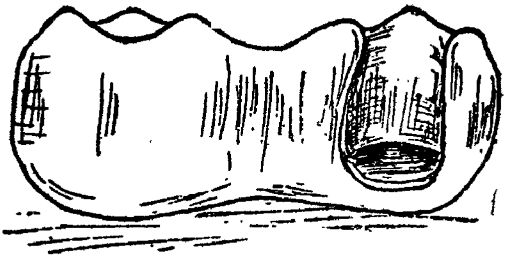


FIGURE 1 (*a*).
Bisected country oven (earthern).

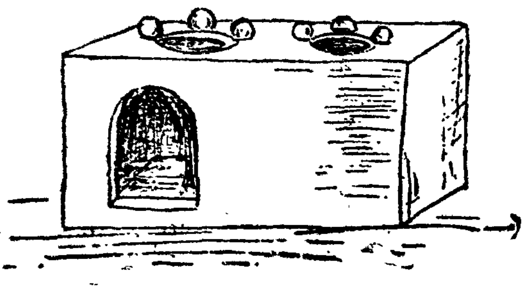


FIGURE 1 (*b*).

Bisected country oven (cement or iron).

1. Since no passage is provided to allow fresh air to pass freely through the oven, it becomes difficult to start fire at the very outset. The problem is two-fold in rainy season, when the fuel also is likely to be wet.

2. No control is gained over the smoke, which slowly engulfs the entire kitchen. Our women therefore constantly suffer from chronic eye and heart trouble. Besides, the smoke blackens the sides of the vessel and the walls of the kitchen.

3. The draft is not fully utilised, as the flames that shoot up spread all round the vessel and become wasteful. So the consumption of fuel increases which is a loss on the national resources of fuel. This emits radiation also within the kitchen, which may well be regulated and utilised otherwise. Besides, this injures the general health of the person attending the cooking. More time is taken in the cooking also.

4. The ashes that fall off are blown by the wind all over the house, leave alone the kitchen. Since the ashes also get accumulated within the oven, where the fuel burns, the cinders get extinguished in course of time.

It is the experiment to remedy these defects in the country-oven that led to the making of the Magan Choola. While doing so, the primary object is to regulate the transmission of smoke from the oven to the outside of the roof of the kitchen; and we come across the Ceylon oven (figure 2), the Hyderabad oven (figure 3) and the horse-shoe-shaped oven (figure 4) prevalent in various parts of the country. But these do not satisfy all the requirements expected of an oven smoke-free and economical. The Magan Choola satisfies these requirements.

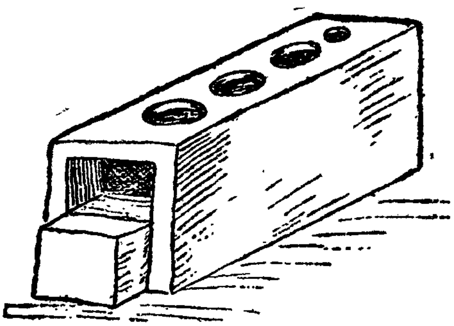


FIGURE 2.

Ceylon oven.

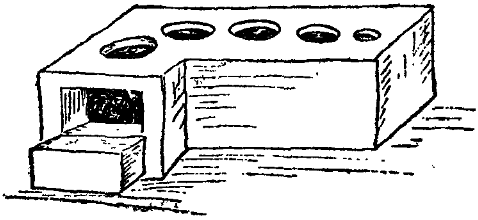


FIGURE 3.

Hyderabad oven.

The Magan Choola, as shown in figure 5, has three pot-seats. Three vessels could be placed on it simultaneously. The fuel is fed from one end of the oven and the smoke is controlled and regulated through a chimney

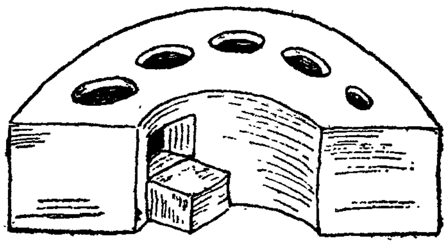


FIGURE 4.

Horse-shoe-shaped oven.

provided at the other end of the oven right up to the outside of the roof of the kitchen. The choola may be prepared to the required size; and wherever big ovens to cook for more than 100 persons may be necessary, they could be built with brick and mortar.

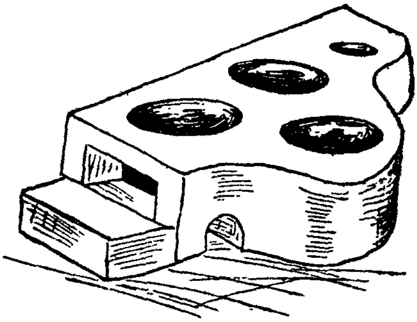


FIGURE 5

MAGAN CHOOLA.

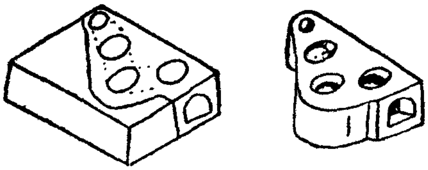
Building a Magan Choola

Clay; cow-dung or horse-dung; straw-cuttings; iron-rings and plates; ash or sand; chimney-pipes; grating; damper.

With the above material, everyone can prepare Magan Choola in their own homes without any extra expenditure. The chimneys in proper dimensions may be got made by the local potter. The iron rings and plates could be had from the local blacksmith. The average cost of this will not exceed Rs. 2 or Rs. 3 and this expenditure will not be high, compared to the durability and efficient service it renders. It can be easily repaired also.

Ten baskets of ordinary clay may be brought and beaten up into pieces. If it contains brick-bats, stones and other hard substances, it may be sieved and soaked in water. Then one basket of straw cuttings or similar fibrous material which will give strength to the oven when dried, may be added. Cow-dung slip may be sprinkled over the mixture of clay and the fibrous material, so as to make the composition into a thin uniform paste. This may be left in shade for nearly a week for aging. During this process, water may be sprinkled on the paste every two days. Bacteria are formed in the clay and this helps the choola to dry hard and strong.

Since this oven would avoid the wastage of heat, as far as possible, and also direct the flames through a controlled passage, the space it would occupy is bound to be larger. It is, therefore, necessary to decide the location of the oven in the kitchen. Care must be taken that it is constructed in such a place where there is adequate light and ventilation. If it is not convenient to build the choola in the kitchen itself, it is advisable to build it in shade on any level spot adjoining the kitchen, lest the clay should get stuck up to the floor, some ash or sand may be sprinkled on the spot where the choola is made.



Let us now suppose that we wish to build a choola, the pot-seats of which will be of 7 inches diameter.

After kneading the clay mixture so well as to make it into a homogenous paste and

collecting it in big lumps, a compact block of 2 feet 6 inches by 2 feet 3 inches by 10 inches with no air space in-between, may be built. The surface and the sides may be levelled with a wooden rod. The slab should, however, not be beaten with a stick or hand. To make regular edges, wooden planks may be used as a guide.

Magan Choola—Top plan.

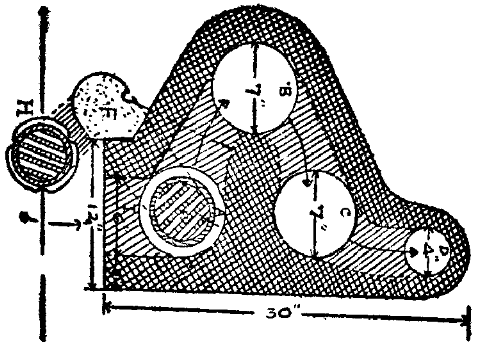


FIGURE 6.

A. B. C. pot seats.
D. Chimney base.
E. Grating.
F. Ash removing pit and additional air vent.
G. Damper through choola wall.
H. Charcoal stove and floor level for roti baking.
I. Fuel entrance.

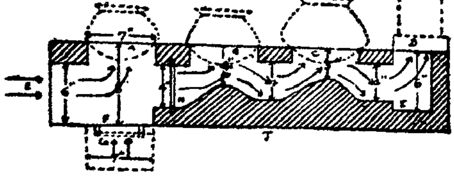


FIGURE 7.

A. to F. same as explained in figure 6.
G. Ash pit and additional air vent.
H. Damper slit.
I. Chimney pit for soot accumulation.
J. Ground level.

When the slab is ready in the required form, a plan of the choola may be drawn (*see* figure 5) on the top surface. While doing so, it should be borne in mind that the thickness of the walls all round the choola may be 2 inches to 3 inches. The space in-between the pot-seats may be of 3 inches. The centre points of the three pot-seats should form the apices of an equilateral triangle. The chimney base circle with 4 inches diameter also may be noted. The choola-sides may then be cut and planed.

Now with a suitable iron cutter, cut out the clay to 6 inches depth in the first pot-seat. Then to insert the grating, leave ½ inch width all round, cut out the clay to full depth, thus making a stand for the grating, which separates the ash-tray from the fire-place. Cut out the clay in the second and third pot-seats to 5 inches and 4 inches depth respectively. Cut out the chimney base circle also to 4 inches depth. Then cut out the passages connecting the first pot-seat and the second, the second and the third, and the third and the chimney base, as shown in the plan. The passages have to be cut deep enough to allow a hand to pass through, and the bridges above them may be made only of 1 inch thickness: otherwise, the flames will pass too deep under the vessels. The inside roof of the passages may be arched to make them strong. Across the flue under the second and the third pot-seats, work up a raised projection of clay-work to two-third height of the passage, as shown in figure, which would baffle and raise the flames nearer the vessel bottom.

Now draw up the front plan and cut out the fuel entrance. Remember to provide this entrance also with arched roof. Push in the damper along the direction shown in the top plan. Check up the circular regularity of the pot-seats by rotating a spherical-bottomed vessel of 8 inches or 9 inches diameter and any irregularities may be corrected now. If this is not checked up while the

choola is wet, correction at a later stage would be impossible. When the choola dries, shrinkage may happen which will ultimately leave crevices, through which smoke would leak. This test may be conducted for two days until the oven gets dry. It may be painted with thin cowdung slip and then allowed to dry. The choola is now ready for installation.

Wherever the same type of choola is required in larger sizes, they may be constructed with brick and mortar.

Installation

The choola may be installed in a convenient place, fixed in the kitchen with due consideration of light and air. It is good to have the chimney erected vertically through the roof supported by the wall. Baked clay pipes of 4 inches diameter may be inserted one over the other and plastered by clay at the joints, until it passes through the roof, and a cowl pipe as shown in figure 8 may be inserted from above the roof. Care must be taken that the joints of the chimney pipes are well plastered, lest it should allow smoke to leak through. The rafters on the roof should be cut just enough to allow the clay-pipes to pass through. The pipes may then be fastened to the wall by wires and nails. The sides of the chimney pipe just above the roof may be plastered well enough to prevent water leaking through into the kitchen.

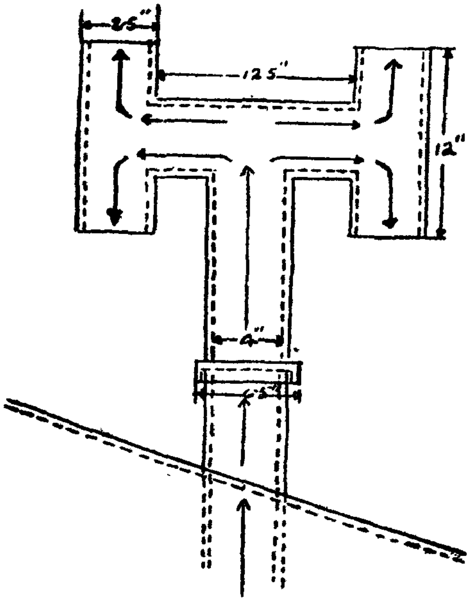


FIGURE 8.

Special owl above roof for smoke to overcome strong winds.

The space connecting the grating and the outside of the ash-pits has to be dug 4 inches deep and plastered well. The choola may now be plastered to the floor with mud-paste.

The use and work of Magan Choola.

Since the choola is made of mud, moisture supplied in the mechanism renders in durable and strong. It is therefore advisable to clean the oven every day before starting fire with a thin fluid of cowdung paste. This process should not be done when the choola is hot as it will only weaken it.

Due to constant use, soot deposits on the inner side of the chimney and it blocks the passage of smoke, which will affect the smooth function of the oven. It is, therefore, necessary to clean the chimney base every day through the third pot-seat. The chimney pipes may also be cleaned once in six months with the aid of a thin, long bamboo staff with some rags tied to it. Or some rags may be tied round an iron rod and lit with kerosene, and inserted into the chimney pipe through the third pot-seat. This also will clean the chimney pipe of all soot.

Before you start the fire, open the damper completely. A few fuel chips may be used to start fire and care must be taken to cover

all the three pot-seats. If the vessel that you want to use is of smaller size than the pot-seat, suitable rings (*see* figure 9) may be placed on the pot-seats, thereby serving the double purpose of covering the pot-seat in full and also allowing the vessel to settle on the seat properly. When you wish to use a vessel larger than the pot-seat itself, it would be good to use a cylindrical ring, wider than the pot-seat, which enables the flames to contract a larger area of the vessel bottom.

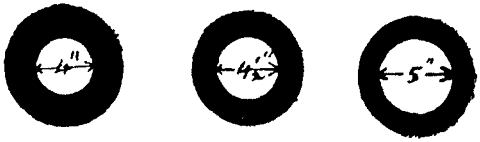


FIGURE 9.
Rings Different kinds.

To be as economical in time, fuel and efforts as possible, we should get quite ready with cooking preparations before we start the fire. Engage the oven fully, so that no pot-seats are left vacant. If you do not require any one of the pot-seats, it would be advisable to keep a vessel of water on it or to cover it with a lid so that the heat would not be wasted and no smoke would escape.

When a bright fire is made, keeping the damper fully open, it will allow smoke to escape through the fire-door. As soon as a bright fire is made, keep it open just enough to prevent the smoke from entering through the fire-door.

The degree of heat supplied by the oven at the three pot-seats is different. At the first pot-seat there will be good heat, whereas in the second and third pot-seats, it will roughly be 60 per cent and 40 per cent respectively. The arrangement of vessels on the three pot-seats should, therefore, be done intelligently, taking into account the degree of heat required by each vessel at different times

The damper may be closed completely when bright cinders get gathered in the oven. This method will maintain the fire to last longer.

Even after the cooking is over, there would still be some heat left over, which may be made use of for light roasting and drying. Fuel and wood-chips may be kept for drying on the space over the choola and inside the second and third pot-seats. These chips and fuel will help to start fire next time, especially in rainy season.

Some special aspects.

To keep it efficient, it is necessary to handle the Magan choola intelligently. The main purpose of it, as we have so far seen, is to utilise the heat as far as possible and to regulate the smoke so as to travel through a controlled passage with the aid of the radiation within the choola. It also counts that the consumption of fuel is lesser to an appreciable extent.

The smoke has a tendency to shoot upwards so long as it is kept hot; but when the heat in it is slowly absorbed by the atmosphere, it ceases to rise up. When it is left absolutely devoid of heat, it becomes denser than air and being reluctant to rise up, it whirls round and round with the breeze and spreads all over the place. Therefore, we have to keep the smoke sufficiently hot as to help the choola work smoothly. We have seen that when the flames pass through the three pot-seats, most of the heat is absorbed by the vessels on them. Whatever remains is usefully utilised to keep the smoke sufficiently hot to pass through the chimney right up to the top. Against a satisfactory draft, smoke cannot retreat and it is equally necessary that no leakage of smoke is allowed through the pot-seats or through the fire-door. It is also essential to keep the smoke free from outside cold air, until it reaches the top of the chimney and mingles with the breeze.

Under normal conditions the heat provided in the choola is just sufficient to keep the smoke in proper movement through the chimney. Difficulty may be experienced when there is a violent wind blowing the

chimney from outside and when there is no such pressure at the fire-door of the choola, which will affect the smoke from issuing out. This causes pressure in the chimney too and makes the smoke denser within the chimney. The smoke, having been prevented from rising upwards, finds its way through the fuel door. Ultimately the draft fails, and the flames get extinguished.

If there are taller buildings around the kitchen preventing the wind from blowing the chimney violently, this trouble might not arise. However, while installing, care must be taken to have the cowl pipe on the leeward side, lest the wind should affect the draft. In all probabilities, it is most advisable to use the cowl pipe as shown in the figure 8. The speciality of this cowl pipe is that it is provided with four doors and through any of the four doors, the smoke can pass out. This solves the problem to some extent.

It has been our experience that as the size of the chimney pipe differs from 3 inches to 4 inches (diameter), the height also should vary inversely from 12 feet to 8 feet. The taller the chimney and the smaller minimum the size of the chimney pipe, the better the draft and the lesser the consumption of fuel.

The following are the advantages we get in the Magan Choola, as compared to the country choola :—

(1) It keeps smoke properly regularised.

(2) It is easier to start and maintain the fire, as there is always a fresh supply of air from under the gratings, and there is no necessity to blow air frequently.

(3) The heat emitting from the fuel is almost fully utilised. The saving of the fuel is calculated to be about one-third, when properly used.

(4) Besides, the oven being designed to use wood-fuel comfortably, charcoal and other burning materials can also be used in this oven.

(5) The vessels and the kitchen are kept clean of soot.

(6) Different degrees of heat prevail under the three pot-seats, which help the cooking to a great extent.

(7) The person cooking at the choola is freed from the burning heat of the oven. On the other hand a current of fresh air is maintained near the choola by the draft, which keeps the kitchen also cool and comfortable.

(8) The cooking can be done in lesser time, and the person cooking gets some leisure time which he or she might utilise for other purposes.

(9) The heat in the second and third pot-seats may be used comfortably for drying and light roasting. Chips of fuel and firewood may be placed on the oven for drying.

The following special features will be noticed, while comparing the choola with other smoke-free ovens :—

(1) It is purely hand-made and locally made.

(2) Anybody can make a Magan Choola and repair it whenever something goes wrong.

(3) It is durable and comparatively strong.

(4) It is portable to some extent for short distances, and is less unwieldy than other patterns.

(5) The baffles under the second and third pot-seats and the direction of the flue passage to let the flames play well on the vessels, make it possible to decrease the fuel expenditure.

THE PORTABLE MAGAN CHOOLA.

(Kalluppatti Model.)

We have seen that the Magan Choola is bigger in size in order to meet the special requirements and facilities expected of such a choola. It is, therefore, proportionately heavy too and not easily transportable. This presents a problem for its large-scale propagation, especially when it is unwieldy. To rectify this defect, experiments were con-

ducted in the Pottery Section of the Gandhi-niketan Ashram, T. Kallupatti ,in order to render it cheap, durable and light.

The different parts of the choola, viz., the three single ovens serving as the three pot-seats, the chimney base, the links connecting them, the chimney pipes, the cowl-pipes, etc., are prepared separately over the potter's wheel [*see* figures 10 (*a*), (*b*) and (*c*)]. Holes are provided on the side walls of the ovens to insert the link-pipes between one oven and another, and the third oven and

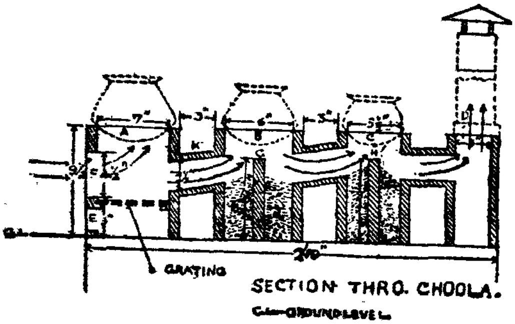


FIGURE 10.

Section through the portable choola—

- **A, B, C : Pot seats.**
- **D. Chimney base.**
- **E. Ash-pit and additional air vent.**
- **F. Fuel entrance.**
- **G. and H. Baffle-walls to regulate passing of flames.**
- **J. Earth filled in either side of baffle walls, while installation.**
- **K. Links between pot-seats.**

the chimney pipe. They are then allowed to dry and then baked as earthen pots. The various parts are then assembled and each joint is plastered with mud. Wherever necessary, two sets of three pot-seats may be linked to one chimney and used by this arrangement.

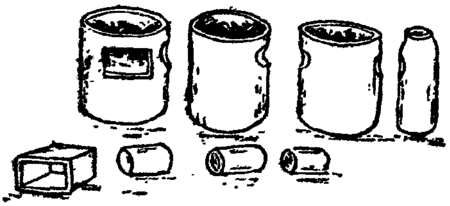


FIGURE 10 (*a*)

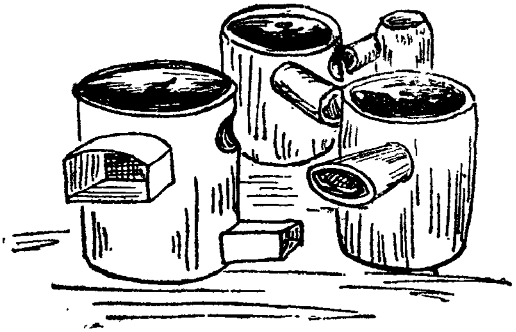


FIGURE 10 (*b*).

(a) and (b) Various parts of portable Magan choola.

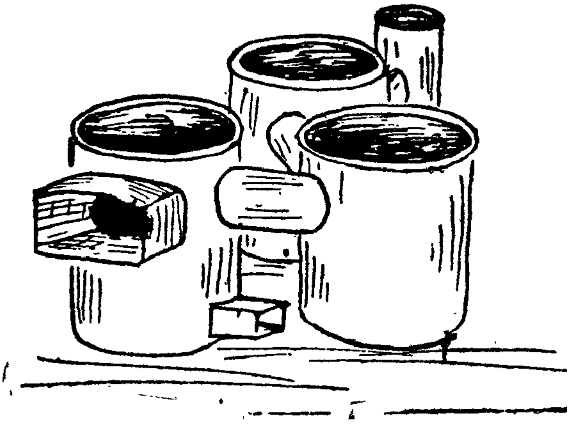


FIGURE 10 (*c*).

The assembled portable Magan choola.

The advantage of this type of choola, compared to the choola of the Maganwadi type, is that it is easily transportable and could be assembled in any convenient place. Where it is required as a permanent fixture, the various parts are assembled and plastered on all sides of the floor with clay.

Another important feature which is worthy of observation is the gradient provided in the flue passage between the three pot-seats. The passages connecting the first pot-seat and the second, the second pot-seat and the third are having a gradient up to the

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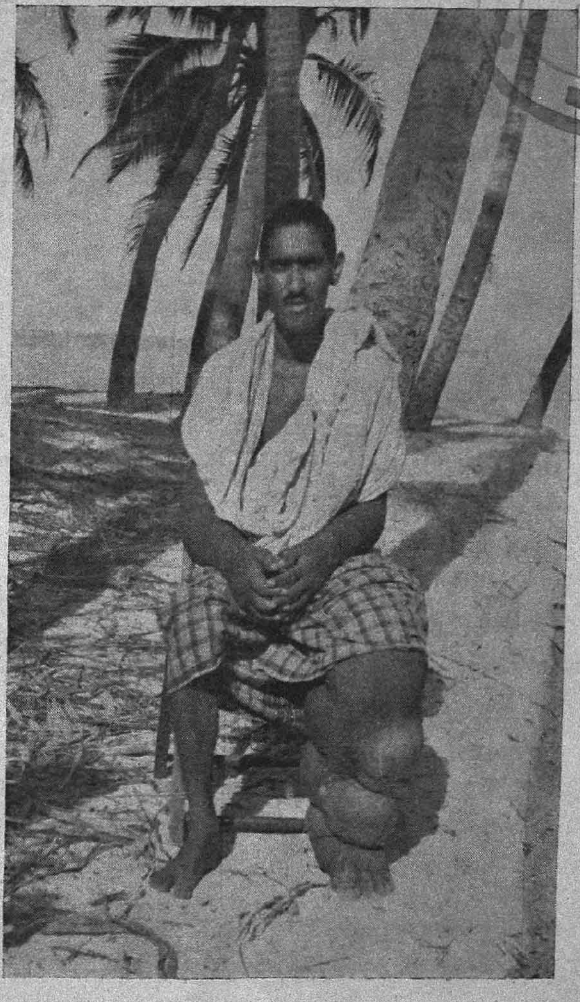
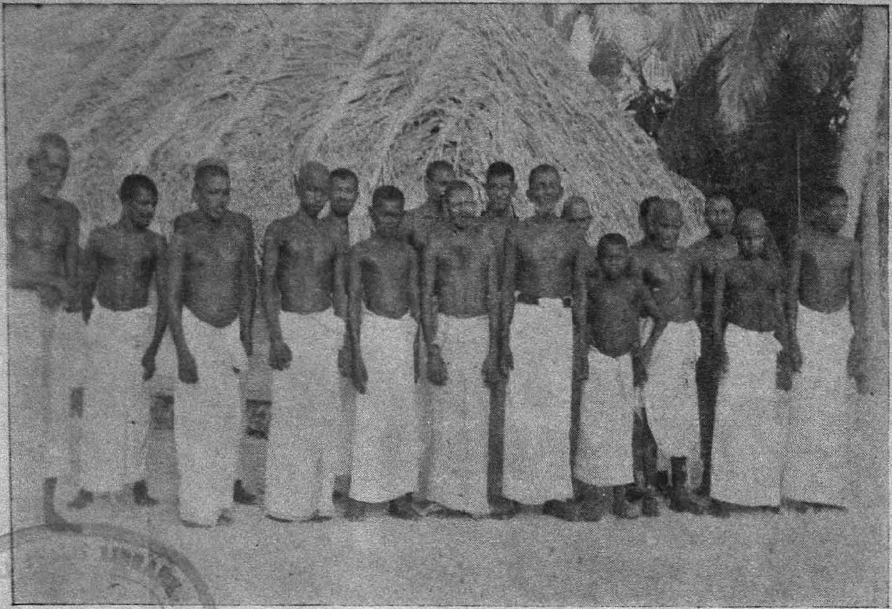
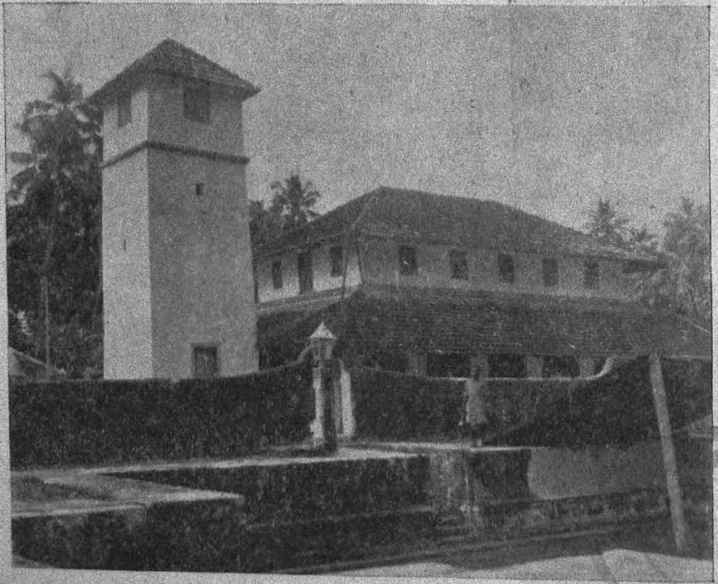


IV. A VICTIM OF FILARIASIS NOTE THE FILARIAL SWELLINGS OF THE UPPER AND LOWER EXTREMITIES.



V. Leper Colony at Minicoy.

VI. Leper Colony at Androth.



II. Mosque at Minicoy note the Pucca Tank.

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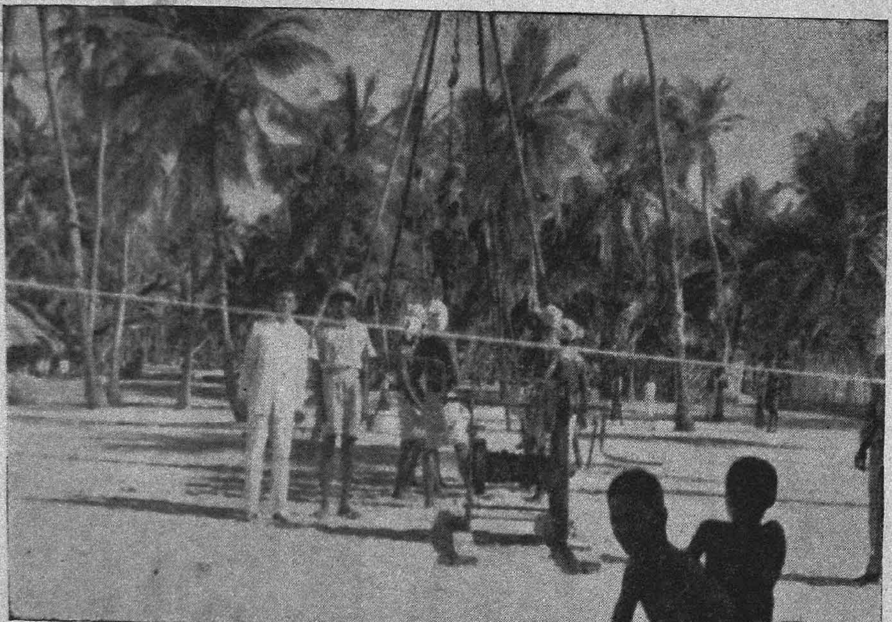
I. Lighthouse at Minicoy.



III. SINKING OF BOREWELL AT KAVARATTY.

chimney base. By providing a gradient up to the chimney base, it has been our experience that the choola will have a better performance, fully utilising the heat units and the smoke entering the chimney base will have sufficient heat to raise it against atmospheric pressure or wind currents above the roof. There is no tendency to have a back draft also by this arrangement. This is an additional advantage available in this choola.

This type of choola is prepared and propagated by us on a large scale. It would be worthy of mention here that it has been found to be cheaper, handier and more purposeful, while maintaining its innate qualities of efficiency and durability.

The Economics of Magan Choola.

A significant part of our national resources of timber is used as firewood. But due to the inefficient performance of the existing ovens, the consumption of fuel is much more than it ought to be. Should the Magan Choola be used in all houses and cooking places, roughly one-third of the timber now consumed as firewood would be saved.

Huge living trees are cut now-a-days for firewood. If we could save one-third of the fuel we consume by using Magan Choolas only, a great deal of our national resources in timber will be saved.

It is also believed that a majority of the eye and heart diseases suffered by the women in our country are due to their exposure to the scorching, radiated heat of the present oven. The Magan Choola has a ready answer to this question. It prevents these diseases to a great extent, and solves 10 per cent of our public health problems.

In India, mostly women do the cooking. " The kitchen ", it is said " is their office." But it is unfortunate that our women who have a great part to play in the task of nation-building, should fully be engaged in the kitchen, leaving them hardly the privileges of social contact and betterment. The Magan Choola shares their burden in the kitchen to some extent and gives them some leisure. They might well use this leisure in some useful avocation and earn a subsidiary income for the family or utilise it in learning.

Village industries enrich the national wealth of the country, while fetching the artisans a fair wage. They are therefore indispensable and should be revitalised to a very great extent. The Magan Choola is a cent-per-cent hand made product and affords employment to the village potter. Anybody who has sympathy for the development and promotion of village industries should support it, and any person using the Magan Choola indirectly serves this noble cause.

A BRIEF REPORT OF THE HEALTH SURVEY CARRIED OUT IN THE LACCADIVE GROUP OF ISLANDS.

BY

Dr. H. Subramaniam, *Regional Malariologist*, **Sri H. Ramoo**, *Senior Entomologist*, *and* **Sri Sam Das Sumanam**, *Entomological Assistant*, *Regional Malaria Organisation*, *Coimbatore.*

General.

The Madras Government sanctioned the deputation of a team consisting of the Regional Malariologist, Senior Entomologist and some subordinate technical staff of the Regional Malaria Organization, Coimbatore, for carrying out a general health survey of the Laccadive group of islands. The Health team accompanied the Revenue Inspection Party during the latter's routine biennial inspection conducted from December 1954 to February 1955. The Laccadive Archipalago forms a long narrow belt extending from the level of South Kanara district in the north to Travancore-Cochin in the south. This group consists of seventeen banks, four of them being submerged. Of the rest there are ten inhabited islands, five under the administrative control of the District Collector, Malabar, and the other five under the control of the District Collector, South Kanara. The island proper is usually a narrow bank of sand piled up by the action of the sea and the wind against the inner side of the eastern arc of the atoll, two or three or even five to six miles long and varying in breadth from half-a-mile to a few yards. The lagoon formed by the encircling reef on the western side of the island is a saucer-shaped depression, its depth being usually not more than 2 or 3 fathoms. The total population of all these islands as per 1951 census is 20,902 and the density of population varies from island to island—vide Statement No. I.

The land in all the islands is almost flat, about 10 to 15 feet above mean sea level. There are slight undulations called 'Thottams' in the middle of the islands. These are not natural formations but have been created by the earliest settlers to duplicate the landscape of Malabar and to raise foodcrops. In recent years, the desire on the part of the islanders to grow cereals in these Thottams has deminished. The soil is sandy and is poor, the top layer consisting mainly of finely disintegrated coral with scanty admixture of surface humus. Water drains easily through the soil. A few feet below the surface soil, there is a limestone stratum varying in thickness from 6 inches to 2 feet in different islands. Beneath this lime stone stratum, there is a layer of sand containing drinkable water, the water-table being thus very high. Water-supply in the islands is provided by wells and tanks. Practically every house has a step-down well attached to it. It is a mere hole in the ground with narrow steps leading down to the water surface. The water-supply should therefore be considered abundant and perennial. Tanks are also numerous. They are either katcha pond like depressions or pucca with masonry rivetments and stone steps. The main bulk of the rainfall is received through the south-west monsoons. During the monsoon months, all communications with the outside world are cut off. While the average annual rainfall in the southernmost island is about 100 inches, it is below 60 inches in the northernmost island. The islands are not subjected to extremes of temperature. The northern islands are said to be warmer than the southern islands. The islanders except in Minicoy are all Moplahs. The inhabitants of Minicoy are Mahals. They are entirely a different race and speak a different language called Mahal. The

Moplahs of the Laccadives speak Malayalam with a slightly different accent. The entire population of all the islands are Muslims. The islanders are expert seamen and are adepts in boat-making. In Minicoy ' Bonito ' or ' Mas ' fishing forms an important and valuable industry, the other industries such as coconut farming and coir-making being very much limited in that island. In the other islands, the chief industry is coconut farming and coir-making. Minicoy is in advance over the rest of the Laccadives in respect of economic, housing and other living conditions. On the whole, the economic level of the islander is generally low and in many islands on the verge of poverty.

Public Health Laws and Vital Statistics.

2. None of the laws applicable to the State like the Madras Public Health Act, Local Boards Act and other regulations seem applicable to these islands. The only laws in force are the Laccadive Islands Regulations of 1912 and the Customary Laws. The former Act provides for compulsory registration of births and deaths. In the Malabar group of islands, the system of administration is carried on by the ' Amin ' assisted by a number of Karnavars, while the South Kanara group is under the immediate control of a Deputy Tahsildar assisted by a Karani in each island. The Amins and Karanis attend to the registration of Vital Statistics in their respective islands. Despite the fact that the registration of Births and Deaths is compulsory, little attention is being paid to this aspect of public health work and most of the figures available are misleading and defective. On the whole this work is anything but satisfactory.

Filariasis.

3. This is by far the most important and crying Public Health problem in six of the nine islands surveyed, the filarial endemicity rates varying from 5·0 per cent as high as 47·8 per cent, the overall endemicity for all the six islands endemic for filariasis working out to 27·0 per cent. In all the islands only W. bancroftian infection was recorded. In the Laccadives, the distribution of filarial disease corresponds closely with that of filarial infection, C.fatigans was incriminated as the only vector in the Laccadives. Filariasis is endemic in all the islands where there is C.fatigans. In the islands which are free from filariasis C.fatigans is also conspicuously absent. The epidemiology of filarasis in the Laccadives may be summarized as ' No. C.fatigans—no filariasis '. Wherever C.fatigans was recorded, it constituted over 95 per cent of the adult mosquito density. The complete absence of C.fatigans in a few islands, namely, Ameni, Kavarathi and Minicopy is difficult to explain. The restricted distribution of this species only in certain islands may be due to many factors. A summary of the findings of the filariasis survey is furnished in Statement II.

Malaria.

4. There is no evidence of a malaria problem, either endemic or epidemic in any of the Laccadive islands. Fevers of malarial origin are practically unkonwn to the islanders. While the anopheline fauna is conspicuously absent in Minicoy, its distribution is extremely limited in other islands to a few species only. Of the five anopheline species recorded in all the islands, only A varuna is of some malariogenic significance. The intensity of its breeding whereever found was scanty and no adults were recorded during the present enquiry.

Rat Flea Survey.

5. A rat flea survey was attempted in Androth, Minicoy and Kavarathy islands. Rats constitute a serious pest of the coconut trees in many lislands. They live and breed on the top of coconut trees and have become

entirely arboreal. Rats are therefore exceedingly rare inside human dwellings. A total of 15 Rattus, rattus and 4 mice only were caught and examined. Except X. cheopis no other species were recorded in the survey. Organized attempts at rat destruction are made by the islanders in connexion with coconut protection.

Cyclops Survey.

6. This survey was carried out in all the islands. Many ponds and tanks were positive for Cyclops hyanus and leukarti. There is however no evidence at all of the existence of Dracontiasis in any of the islands at any time.

Phlebotomous Survey.

7. Careful searches inside dwellings failed to reveal any species of Phlebotomous. Obviously conditions favouring the bionomics of this insect do not exist in the islands.

Trachoma.

8. The commonest Public Health problem in most of the islands which requires immediate attention is Trachoma. Except in Minicoy and Kavarathi this disease is widely prevalent in other islands. Women particularly are mostly affected. It is less common in children and rare amongst men. The ladies of all the islands have the habit of bathing in certain common ponds and tanks which are invariably dirty containing turbid and coloured water. The epidemiology and mode of spread of this disease is not clearly understood. Eye flies of the genus Syphonculina were not met with in any of the islands at the time of our enquiry.

Venereal disease.

9. One is struck by the absence of prevalence of veneral diseases in most of the islands. Only few men from these islands visit the mainland and that too only occasionally. Their stay in the mainland is for brief periods only. The womenfolk have practically no oppurtunity to visit the mainlands. Mainlanders seldom visit these islands. Such restricted movements, opportunities and intermingling of population is apparently the cause for the absence of veneral disease in the islands. The island of Minicoy alone is an exception to this freedom from veneral disease. Gonorhœa was greatly prevalent amongst both the sexes in this island. Syphillis and other diseases of veneral origin were not come across. Clinical diagnosis of the cases was only possibl. Twenty-eight cases of gonorhœa were treated with Penicilin Aluminium Monosterate. The relief afforded was so prompt and quick that almost all the sufferers in the island resorted to treatment. Ninty-five per cent of the cases treated were women whose husbands are employed as crews in ships which visit ports like Bombay, Madras and Calcutta. Intensive enquiries in other islands failed to reveal any case of veneral disease.

Helminthic Infections—Intestinal Nematodes.

10. Examination of stools of school children was undertaken in the islands of Minicoy, Androth, Kavarathy, Agathi and Amini. In all, a total of 586 speciments of stools were examined. The percentage positive for round worm infection varied from 80 to 93 per cent. Infection with Trichuris Trichiura was equally common. The entire community may be said to be infested with one or the other worm. The infection was very heavy in all cases. Only one or two specimens showed eggs of Ankylostoma deodenale. Cases simulating Bronchial Asthma were common both amongst children and adults. Twenty per cent of the school children gave history of Bronchial Asthma and all these children showed heavy infection with round worm eggs in their stools. No eosinophilic count was attempted.

Diseases of the skin.

11. Minicoy island was free from any kind of skin diseases not even Taenia Versicolor. Scabies was present on a large scale amongst

school children at Ameni. At Androth and Kavarathy some cases of Taenia Versicolor, fungus infections of the skin and a variety of skin conditions including Eczema were met with.

Flourosis.

12. In the island of Kavarathy several grown-up children were found to have distinct and extensive mottling of the enamel of their teeth. For want of facilities no sample of drinking water was taken for chemical analysis from this island.

Malnutrition and avitminosis.

13. Rice, coconut, and fish are the main food of the islanders. Bread fruit and drumstick are available in most of the islands during certain seasons. Lime fruit trees were said to have been once plentiful in all the islands. Unfortunately, most of them have withered and no attempt is made to replace them. Fowls and eggs are available in plenty, but milk is a rarity in all the islands. A few cattle are imported for slaughtering only. The islanders mostly depend on rice and cereals imported from the mainland for their food. The quantity and quality of their food are therefore naturally very poor and monotonous. A further limitation to their nutritional conditions is reached during monsoon months when the stored up foods are depleted and even fishing is impossible due to rough seas. Minicoy is an exception in many respects from the rest of the islands. Their economic and nutritional conditions are comparatively good.

Smallpox and vaccinal conditions.

14. Smallpox in the past caused great havoc in many of the islands and had taken a heavy toll. Periodical visitations of small epidemics have been reported. Despite the poor vaccinal condition of the people, Minicoy alone has not witnessed any large scale epidemic of smallpox. The people here observe a strict system of isolation by custom. When a case of smallpox or any eruptive fever is noticed the people themselves arrange for isolation of the sick to a small islet known as 'Smallpox Island' about two miles away from the main island. The other islands witnessed a severe epidemic in 1945. The present vaccinal conditions of the children are fairly satisfactory in all the islands, vaccinations having been attempted wherever there were epidemics and during the Inspecting Officer's visit.

Bacilliary dysentry.

15. A good deal of havoc and loss of lives have been caused by epidemics of dysentery sweeping over the islands. Very frequently outbreaks of dysentery in varying degrees of intensity seem to have been a common feature in the islands. Occasionally it assumed fulminant forms as at Agathi and Ameni during 1954 and 1955 respectively. Minicoy and Androth continued to be free from such outbreaks. In these islands the wells are protected with parapet walls without much risk of pollution with surface water.

Dysentery epidemics whenever they occur, assume big proportions during monsoon months when the nutritional condition of the people is low and when surface contaminations are washed into drinking water wells.

Leprosy.

16. Cases of leprosy were noticed in six islands while the rest four islands—Kalpeni, Agathi, Kiltan and Bitra appeared totally free as evidenced in an almost house-to-house survey.

In Minicoy, the incidence of leprosy is highest as compared to other islands. People are aware of the infectious nature of the disease and there is a leper settlement in one corner of the island. The Government gives a subsidy of Rs. 10 per patient per month isolated here. There are 33 patients receiving treatment here while another 24 cases are treated as out-patients. The gross

incidence of leprosy is 16·5 per thousand of the population; 66 per cent of cases examined were neural, while the rest were of Lepromatous type.

In Androth also, by voluntary efforts, a leper colony has been started but it is not functioning as soundly as the one in Minicoy. The problem here is not as serious as in Minicoy and many cases of skin conditons have been mistaken for leprosy.

In the islands of Kavarathy, Chetlat, Ameni and Kadamath, the number of cases of leprosy range from 6—12. Isolation of cases is easy in all the islands if proper facilities are offered.

Medical Relief arrangements available in the Island.

The earliest Government Dispensary to be started in these islands is the one at Ameni in 1874 and another in Minicoy during 1891. At present there are five dispensaries of modern medicine in the islands of Minicoy, Kalpeni, Androth, Kavarathy and Ameni—each in charge of an Assistant Surgeon. The hospital staff, besides the Medical Officer, consists of a compounder, a Maternity Assistant, a male nursing orderly and a sweeper for each of the dispensaries. While the medical staff in Minicoy, Kalpeni and Androth are stationary, those at Kavarathy and Ameni run itenarant dispensaries in the adjoining islands. The Medical Officer at Kavarathy moves with his entire staff to Agathy for four months in a year. The Medical Officer at Ameni tours for short periods in a year in the islands of Kadamath, Chetlat, Kiltan and Bitra. A second Maternity Assistant under the control of the Medical Officer at Ameni is solely for touring in the islands of Kadamath, Chetlat, Kiltan and Bitra for attending to labour cases and minor ailments.

The dispensaries are well-attended and freely made use of by the public. There is also a small ward attached to the dispensary at Androth and an emergency ward of two beds in the dispensary at Agathi.

The Medical Officers are posted to these islands before the outbreak of the south-west monsoon. They stay in the island for one year and then they return to the mainland. There are six Maternity Assistants in the five dispensaries, three of these being Muslim islanders trained at Kozhikode and the rest from the mainland who have to serve for two years at a stretch in the islands. Services of the Maternity Assistants are freely availed of by the islanders.

Public Health Activities Carried out in the Islands by the Survey Party.

(*a*) A dispensary was run in all the islands visited and 480 patients were treated. Mass treatment with P.A.M. was carried out in Minicoy island for venereal disease.

(*b*) Free distribution of milk powder was carried out in the island of Agathi which suffered from an outbreak of dysentery epidemic during 1954.

(*c*) Scabies treatment was carried out in Ameni island amongst school children.

(*d*) Hetrazan treatment was undertaken amongst micro-filaria carriers in Androth and Chetlat islands.

(*e*) One round of DDT indoor residual spraying of all houses was done in the island of Androth, besides treatment of all breeding sources with B.H.C. Anti-larval measures were also carried out in the islands of Kiltan and Minicoy.

(*f*) Chlorination of all wells was done in the island of Agathi which had an epidemic of dysentery in 1954.

(*g*) In all the islands, at a meeting of the islanders convened by the Island Inspecting Officer, the public health problems and remedial measures were explained to the people.

(*h*) The Industries Department installed ten bore-wells in three of the islands.

STATEMENT No. I.

Serial number and name of island.	Under the control of.	Aree in square miles.	Area in acres.	Population 1951 census.	Density of population per square mile.
(1)	(2)	(3)	(4)	(5)	(6)
1 Minicoy	District Collector, Malabar.	1·75	1,120	3,447	1.970
2 Kalpeni	Do.	1·02	650	2,269	2,205
3 Agathi	Do.	1·08	688	2,038	2,020
4 Androth	Do.	1·67	1,067	3,651	2,186
5 Kavarathi	Do.	1·35	865	2,404	1,667
6 Ameni	District Collector, South Kanara.	0·95	622	3,159	3,257
7 Kadamath	Do.	1·17	748	1,642	1,403
8 Chetlat	Do.	0·39	255	994	2,549
9 Kiltan	Do.	0·62	397	1,252	2,019
10 Bitra	Do.	0·05	26	46	4,600
	Total ..	10·05	6,438	20,902	2,090

STATEMENT No. II.

Serial number and name of island.	Filarial disease rate.	Micro-filaria infection rate.	Filarial endemicity rate.	Culex fatigans density P.M.H.	Infection rate in C. fatigans.
(1)	(2)	(3)	(4)	(5)	(6)
	PER CENT.	PER CENT.	PER CENT.		PER CENT.
1 Kalpeni	16·29	9·7	26·0	84·5	Nil.
2 Androth	29·7	18·19	47·8	20·6	17·7
3 Agathi	0·8	4·2	5	19·0	8·6
4 Chetlat	13·4	13·0	26·4	27·0	15·6
5 Kiltan	5·5	8·4	14·0	75·0	17·0
6 Kadamath	7·0	14·0	21·0	38·3	19·1

RESULTS OF CONTROLLED INVESTIGATIONS ON B.C.G. VACCINATION

BY

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[From 'The Indian Journal of Tuberculosis', Volume II, No. 4, pages 12.–126].

In Malta, 36,320 BCG vaccinations were done in 1950, and records of follow up were kept (Zammit 1952). Out of these 54 (0·15 per cent) got glandular enlargements in the armpit two to four months after vaccination, which became soft and were aspirated. All eventually healed without leaving any permanent damage or defects. Twenty-three cases (0·075 per cent) developed a tiny ulcer at the site of vaccination between the 30th and the 53rd day, but all healed eventually. Two developed some fever and constitutional symptoms for a few days only. None developed blindness or tuberculosis or any permanent defect. There was no death on account of BCG.

It is important to note that there were no major complications. The enlargement of armpit glands or formation of a tiny ulcer at the site of vaccination in about 0·2 per cent of cases is the expected normal rate of slight inconveniences met with in this vaccination, and is less than the fever and the swelling met with in many other vaccinations.

Animal experiments.

2. Since 1930 several bacteriologists have made repeated attempts in their laboratories to see if the organism in the BCG vaccine can again become virulent and dangerous either in cultures or in animal bodies. None of these attempts have so far succeeded and the BCG organisms could not be made virulent or dangerous.

Some persons have quoted Pierce and Dubo's (1955) recent work in which they mention that substrains of BCG obtained from four different laboratories differed in the degree of tissue invasiveness in guinea-pigs but these critics have conveniently ignored quoting that part of the work of these authors (Tubercle, April 1955) which mentions that although these substrains of BCG differed in degree of tissue invasiveness, they were all found to give rise to self-limited lesions in healthy guinea-pigs even when they were injected by intravenous route. That is, they did not produce progressive diseases even in guinea-pigs, who are many times more susceptible than human beings.

Other experiments done to test the effects of BCG vaccination on guinea-pigs are as follows :—

One group of the guinea-pigs was given vaccination and another group was left unvaccinated. After eight to twelve weeks a challenge infection of virulent tubercle bacilli was injected in equal dozes into both groups. Both the groups were kept under similar conditions and were observed for several weeks. It was found—

(1) The average period of survival of vaccinated group was much greater than that of the non-vaccinated group.

(2) Some guinea-pigs were killed from each group at equal intervals after challenge infection, and on post-mortem it was seen

that the number and the extent of pathological lesions were much less in the vaccinated group than in the non-vaccinated group.

(3) Lastly, the bacterial population in these lesions was much less in the vaccinated group than in the non-vaccinated group.

These comprehensive experiments show that the vaccinated group due to the increase of its specific resistance by BCG vaccination enjoyed a greater degree of protection than the non-vaccinated group.

Experimental work published in "The American Review of Tuberculosis" (Abstracts, September 1953) showed that tubercle bacilli multiplied freely within the cells (monocytes) taken from normal guinea pigs or rabbits by contrast, intra-cellular multiplication of tubercle bacilli was retarded or completely inhibited within the cells taken from animals previously vaccinated with BCG.

Controlled experiments on human beings.

Clinical evidence has been collected from observation among the following categories: (1) Red Indian children; (2) Red Indian infants; (3) Danish girls; (4) Canadian nurses; (5) English children; (6) American children; (7) Swedish Army recruits; (8) Japanese young adults and children.

Joseph D. Aronson, of the Henry Phipps Institute, University of Pennsylvania, U.S.A., and C. E. Palmer report in "The American Review of Tuberculosis" (1946, 1948) that Red Indian American children are said to have very little resistance against tuberculosis. Morbidity from tuberculosis among them is high. Therefore, it was decided to increase their specific resistance by BCG vaccination and find out whether they get any increased protection from this deadly disease.

Two groups of non-infected Red Indian children in the U.S.A., and Alaska of school and pre-school age, were selected. One group of 1,550 children received BCG protection, the other group of 1,457 children received only normal saline injection.

They were allowed to continue their natural way of life before and after vaccination. Both groups were followed up and examined annually from 1937 to 1951 (13 to 15 years). Almost an equal number of children were followed up in both groups for this long period. Here are the results of this scientifically controlled observation lasting for more than a *dozen years* :—

(1) In the BCG vaccinated group, six died of tuberculosis, whereas in the group which did not receive BCG vaccination 52 died of tuberculosis during the same period. In other words, the vaccinated children enjoyed a protection which was about 8·7 times greater than that enjoyed by the non-vaccinated.

(2) Further, the same author gives the results of BCG vaccination on new born infants observed between 1939 and 1941 in the same community and area. During the period, out of the 123 BCG vaccinated infants, none died of tuberculosis but seven died of non-tubercular diseases. Of the 139 unvaccinated infants, four died of tuberculosis and 11 from non-tubercular diseases.

This observation is doubly important. First, it shows that BCG vaccinated new-born infants compared with unvaccinated enjoyed four times the protection against tuberculosis. Secondly it proves that BCG does not give rise to any serious complications, for the number of deaths due to all causes, besides tuberculosis, was also less among the vaccinated infants than in the non-vaccinated.

This observation must satisfy those who are trying to prove that all ailments which children get after BCG vaccination are due to that vaccination.

3. Hyge, from Denmark, reported in 1947 that in a school in that country an unsuspected female case of open tuberculosis

was working as a teacher for two months before she was diagnosed. She had come in intimate contact with about 200 girl students during that time. At that time all these student contacts were also examined. It was found that 106 girls had already been BCG vaccinated and 94 were non-vaccinated. Full records of these girls were kept and they were examined at intervals. It was found that of the vaccinated group two developed tuberculosis. But in the unvaccinated group, 41 developed tuberculosis.

There cannot be more convincing proof of the safety and efficacy of BCG vaccination than this unfortunate accidental experiment by nature without the previous human knowledge or plan.

4. Ferguson of Saskatchewan, Canada, after 2·4 years follow-up reported in 1949, in 'Tubercle' that amongst 1,005 BCG-vaccinated nurses, 0·9 per cent acquired tuberculosis, whereas of 1,368 unvaccinated tuberculin negative nurses, 4 per cent acquired tuberculosis, that is, about four times as many.

5. R. Stevenson Doig (School Medical Officer, Stornoway, England) reports in the "Lancet" of April 2, 1955, that in 1950 a group of 3,000 children were vaccined and another group of 2,814 children who were also tubericulin-negative were not vaccinated.

Both the groups were followed up for four years and careful records were kept. It was found that by 1954 none of the vaccinated group had developed tuberculosis whereas nine children from the unvaccinated group had developed tuberculosis.

6. Stein and Aronson carried out scientifically controlled observations at the Henry Phipps Institute, University of Pennsylvania. They reported in "The American Review of Tuberculosis" (November 1953) that 1,540 persons were BCG vaccinated and 1,450 tuberculin-negative were not vaccinated. The two groups at the beginning of the study were comparable in age, sex and economic condition. They were followed up for about a period of nine to 11 years and X-ray and other examinations were done at yearly intervals. It was found that 4·1 per cent of the BCG vaccinated developed tuberculosis during this period.

7. Next we come to a study on Swedish Army recruits by Dahlstrom and Difs (1951) which for its thoroughness and details has been compared to a controlled laboratory experiment. During 1941–44 they followed up and investigated 36,235 vaccinated and 25,239 unvaccinated tuberculin negative young recruits who lived under practically similar environments. They have made several interesting and instructive discoveries as the result of their exhaustive studies. Briefly, however, their finding was that during these four-year period of observation there occurred 0·3 per cent cases of tuberculosis in the BCG group and 0·7 per cent in the unvaccinated group, that is, the vaccinated group enjoyed a protection which was 2·3 times over the unvaccinated.

Regarding deaths from tuberculosis during the same period the vaccinated group enjoyed the protection which was three times the non-vaccinated group.

8. Finally, it is interesting to note that the largest controlled study on effects of BCG vacination in human beings has been done in an Asian country, namely, Japan, Crawford has published the details of this study in the "American Journal of Public Health" (July 1954). He mentions that tuberculosis was a leading cause of death in Japan up to 1951. The mortality rate was 282 per lakh of population in 1945. It was found that about 30 million of people between the ages 0–29 years were tuberculin negative. Twenty-seven million of them were vaccinated between 1945–1951. The death rate from tuberculosis dropped from 282 per lakh in 1945 to 82 per lakh in 1952. That is, within seven years there was

a startling drop of 70 per cent. Practically all this drop occurred between the ages 0-29 years. This is all the more startling when it is remembered that all environmental factors including overcrowding, malnutrition and collapse of normal living caused by destruction in war should have caused an increase in death rate, as it did cause an increase in war-ravaged European countries. All this emphasises the importance of BCG in mitigating the menace of tuberculosis even under adverse environmental conditions. No one denies that raising the standard of living and isolation of sputum positive cases in hospital beds is of prime importance. But while these important measures are also being attended to they will take a quarter to half a century to develop. Therefore BCG vaccination is a necessary supplementary measure to meet the present day emergency in our country where tuberculosis has become a leading cause of disability and death.

THE FIRST REPORT OF THE MEDICAL RESEARCH COUNCIL'S INVESTIGATIONS INTO THE VALUE OF VACCINATION AGAINST TUBERCULOSIS.

The report is published in the British Medical Journal of 25th February 1956. It shows that vaccination of children in their 15th year substantially reduces the risk of contracting tuberculosis in adolescence.

Background of the investigation.

The investigation was started in the year 1950. Although deaths from tuberculosis have been showing remarkable decline under modern treatment, the annual incidence of the disease continued to be fairly high. So it was decided to assess in a scientific manner, the contribution that the vaccine would make to the control of tuberculosis in Britain. Two vaccines were used in the trial conducted by the Medical Research Council's Tuberculosis Research Unit, namely, BCG (developed in France), now in use in many countries, including India, and Vole vaccine, a British vaccine, developed in recent years in Oxford.

Description of the investigation.

An effort to establish the value of these vaccines scientifically, necessitated an extensive investigation, probably the most detailed of its kind undertaken. Beginning in 1950, three special medical teams, each equipped with a mass X-ray unit, visited schools in or near London, Manchester and Birmingham—most congested industrial centres. School children between 14–15½ were selected as volunteers under the scheme. Each volunteer had a chest X-ray and a tuberculin skin test and selected eligible children were given either BCG or Vole Bacillus vaccine. Those found to be suffering from Tuberculosis or known to have been in recent contact with Tuberculosis were excluded from the trial. By December 1952, more than 56,000 children had joined the scheme.

The negative reactors (i.e.) those eligible for vaccination were divided into three groups by a random process: (*a*) Unvaccinated. (*b*) BCG vaccinated, (*c*) Vole vaccinated. All these were carefully and systematically followed up by regular X-ray examination, enquiries by post, periodic home visits by Health Visitors and re-visits

by the teams and information was collected about the development of any cases of Tuberculosis among the participants.

By the end of June 1955, every participant has been in the trial for at least 2½ years, and many had been followed up for nearly four years.

Summary of the findings.

As a result of these studies it was found that—

(*a*) the incidence of Tuberculosis in the unvaccinated group was 1·94 per 1,000; in the BCG vaccinated group it was only 0-37 per 1,000 and in the Vole Bacillus vaccinated group it was only 0·44 per 1,000. This represents a valuable contribution to the prevention of Tuberculosis and the above report establishes beyond question the short-term value of vaccination of young children.

(*b*) There were no cases of military Tuberculosis or Tuberculous Meningitis (serious forms of Tuberculosis among children) among the BCG or Vole vaccinated group; whereas in the unvaccinated group there were three cases of Tuberculous Meningitis of which two were associated with military Tuberculosis. This is a very striking difference in the two groups.

(*c*) The vaccinated children fared better than those who were naturally infected but who were without evidence of clinical disease at the time of entry into the scheme.

A schematic representation of the findings is given below :—

ANNUAL INCIDENCE.

I	II	III	IV
Tuberculin negative unvacci nated.	**Tuberculin negative BCG vaccinated.**	**Tuberculin negative Vole vaccinated.**	**Tuberculin Positive.**
1·94 per 1000	**0·37 per 1000**	**0·44 per 1000**	**1·75 per 1000**

The complications after BCG were very few and mild and consisted only of enlargement of glands in the axilla and delayed healing of the local ulcers.

The British Medical Journal in its editorial on the report states " This trial shows beyond doubt the benefit of BCG vaccination for adolescents in an urban industrialized country. The differences between the vaccinated and unvaccinated groups are so striking that some of the more ardent advocates of BCG may feel that the delay in introducing BCG vaccination as a routine measure in Britain, which made this trial possible, was unjustified."

The investigation is being continued in order to assess the duration of protection given by each vaccine and whether those protected from Tuberculosis in the first few years after vaccination, will remain protected in later life. It should also not be assumed that although the vaccine could contribute much to the prevention of Tuberculosis, efforts to control the disease by other means can be relaxed.

BE SURE YOU GET YOUR MINERALS.

You'll not get wealthy from the minerals in your body, but you'll be wise to be sure of enough to be healthy.

[From " Today's Health ", October 1955, pages 32 to 35.]

Your body contains an amazing assortment of minerals. Two of them are known to practically everyone. Who hasn't heard those tired phrases about " iron for rich, healthy blood " and " calcium for strong bones and teeth "?

So often has the need for these minerals been emphasized that we are likely to think our needs begin and end with them. But they are only two of the more than twenty different minerals that are bound up in the complex chemistry of our bodies. At least fifteen of them perform essential functions. The rest occur in such tiny amounts that they probably serve no purpose at all. But scientists have a hunch that these rarer elements may function in ways that are yet unknown. Take the mere speck of aluminium found in the brain. There's no apparent reason for its presence, but with radioactive tracers it may be possible to track down this substance and determine if it's one of the things that spark our mental processes.

Scientists, with their passion for exactness, estimate that our total mineral content weighs about six and one-fourth pounds, and that it is worth a mere 97 cents.

The surprising thing about these minerals of ours is that even though there's barely a handful of them in the body, many of them are basic to the processes that keep us alive. A minute quantity of calcium, for instance, keeps the heart beating regularly and steadily. Without it the heart beat either becomes erratic or ceases entirely.

Or look at the vital role of iodine. There's scarcely enough of it in the entire system to cover the head of a pin. But this tiny pinch helps to make the difference between a person normal in growth and intelligence and a dwarfed, stupid creature known as a cretin.

It's evident from these facts that the minerals we're made of have a lot to do with keeping us in tiptop physical condition. So here's a summary about the essential minerals. Iron, calcium, phosphorus and iodine head the list. These are not only the most important to us of all the minerals; they are also the ones in which our daily diets are most likely to be in short supply.

Why you need Iron.

About one-tenth of an ounce of iron, about the weight of a copper cent, is present in the whole body. With hairsplitting accuracy, it is parceled out to each of the 30 trillion red blood cells where it enters into the formation of hemoglobin. This vital iron compound is the key substance by which the red cells transport oxygen throughout the body. Obviously, if something suddenly caused your hemoglobin to drop to zero, you would promptly smother to death.

Each iron-bearing red cell lives about 120 days. During this time, it constantly journeys back and forth along the 70,000 mile-long network of arteries, veins and capillaries, taking in oxygen from the lungs on the outgoing trip and picking up carbon dioxide on its return. This continuous traffic rush exhausts the red cell fast enough so that we must manufacture about one billion new ones every minute to replace those that are worn out.

Since the body has no storehouse for iron, a steady supply is needed to keep enough red corpuscles on the job. This problem is met in two ways. First, iron from the broken

down cells is salvaged and sent to the bone marrow where it is used to produce new cells. Second, the manufacturing process is kept up through iron from our food.

If you eat enough iron-rich foods, you needn't worry too much about a diminished supply of rich, healthy blood. Sometimes, however, our iron resources fall short of our needs. When this occurs, iron deficiency or nutritional anemia results. There are many forms of anemia, some that are not caused by lack of iron. But the most prevalent of all so-called thin blood conditions is simple anemia due to iron shortage. Millions of Americans, supposedly well-fed ones, are victims of this condition.

In anemia the red cell count drops from a normal five million cells per cubic centimeter of blood to three, two or even less than one million. The body then sends out telltale symptoms of oxyzen lack. Usually, they come on gradually. You feel utterly fatigued, weak and nervous. You may also have headache and shortness of breath. If these symptoms occur and persist, don't indulge in self-diagnosis or resort to self-treatment with " magic " blood builders. Rather, you should consult your doctor for the diagnosis and treatment of anemia demand medical skill.

Nutritional anemia can occur as early as the sixth month of life. At this age the store of iron with which babies are born may run out. Moreover, the percentage of iron in milk is very small. Unless iron-rich foods are added to the diet, or unless the doctor prescribes a medicine containing the mineral, anemia may result. Throughout childhood and the rest of the growing years, the disease is also quite prevalent.

Women are affected by anemia more often than men. This frequently results from excessive loss of blood during the menstrual flow, and from drain on the mother's iron supply during pregnancy. On the other hand, men are more likely to lose iron from such conditions as bleeding ulcers and hemorrhoids. But in both sexes diet low in iron may be solely responsible for the disease.

What foods will help keep us full of bounding red corpuscles. Many people believe that calves' liver tops the list. It's a good source, but few food budgets can stand it to-day. Pork liver is not only less expensive, but it is richer in iron than either calves' or beef liver. Other iron-rich foods are molasses, oysters, oatmeal, lean beef, apricots, eggs, raisins (with seeds), potatoes, spinach, cabbage and whole-grain cereals.

With such a varied supply of foods to choose from, it's surprising that nutritional anemia occurs at all. But lots of us are finisky eaters and too many of us are addicted to diet fads—frequently at the expense of the body's iron requirements. So it's quite likely that this form of anemia will continue to be prevalent, although common sense eating habits could go a long way towards eliminating it.

Copper, Iron's Partner.

Important as iron is, it would be as useless as so much sawdust without copper. We need very little copper, but it's all-important in converting iron into hemoglobin. Other tissues also require traces of this mineral, especially those of the central nervous system.

If you have ever taken tonics or pills for anemia, the preparation probably contained some copper along with iron. It is believed that the combined minerals step up the speed with which new red corpuscles are generated.

All foods probably contain some copper and, since practically all normal diets provide several times as much copper as the body requires, deficiency of this important mineral rarely occurs.

Calcium and its Teammate.

Calcium and phosphorus are the body's chief framework materials. They keep every bone strong and rigid, every tooth hard

and durable. • Nature chose well when she selected these substances for our body structure. Proof? Take the shin bone which sustains most of life's hard knocks. This bone alone can support a weight of 3,600 pounds or thirty times its normal load. The rugged quality which calcium and phosphorus give to the teeth is known to everyone who has been subjected to the dentist's drill.

You are probably familiar with calcium as the chief constituent of lime, the stuff ordinary whitewash is made of. The body contains about three pounds of this mineral, 99 per cent of which is in the bones and teeth. The remaining one per cent, howevery, does a lot of dramatic work.

As stated previously, this mineral profoundly influences the action of the heart. According to Dr. Henry C. Sherman, a noted authority on nutrition, " Calcium in the right concentration in the blood is essential to every heartbeat ".

This mineral is also a necessary ingredient of the cement-like substance that binds together every cell in the body. The intricate chemistry of blood clotting likewise depends upon calcium. If the level of this mineral in the blood drops too much, clotting time is markedly prolonged.

In addition, this versatile mineral influences both muscles and nerves. A marked lack of it causes tetany, a nerve conditon in which the muscles become so taut and rigid that spasms may occur. Calcium has a quieting or sedative effect on the nerves.

To some extent we can draw upon the calcium of our bones to tide us over periods when there is a shortage of this mineral. Then calcium is slowly drained from the bones and shunted to other places in the body where it is needed. There is danger, though, in tapping this store too frequently lest we weaken our skeletal framework.

Throughout life calcium is a ' must '. But there are three times when the need for it is of greatest importance—during pregnancy, breast feeding and the years of growth.

Adults also require adequate supplies of calcium every day because there is a constant drain of it from the body. Only through proper diet can enough of this mineral be taken in to equalise the quantity lost.

Do we get enough calcium to meet our needs? Some authorities say that there is a widespread lack of calcium in the average diet, and that most of us need to boost our calcium intake by stepping up our consumption of milk. The National Research Council recommends that the average adult should have at least five quarts of milk, or the equivalent in other dairy products, every week. Prospective mothers, the aged and children need even more.

Other plentiful sources of this mineral include cabbage, collards, kale, lettuce, turnip tops and rutabaga. But calcium from vegetable is not nearly so well taken up by the body as that from milk. Calcium is supplied by eggs, clams, potatoes, lentils. watercress, fish, especially salmon and—for those who are fastidious about their sources of calcium—caviar.

Perhaps you think that nutritionists have made a great to-do about this mineral. Here are some of the reasons why. Dr. Henry C. Sherman says, " The problem of calcium in foods is of great practical impirtance to human health, especially the attainment of high leveels of health and its maintenance through times of special demand ".

Putting it simply, a calcium-rich diet improves growth, increases vitality, adds vigor to later life. If a Fountain of Youth is ever found, its vitalizing waters will certainly contain calcium.

What about Phosphorus.

In its pure, natural state phosphorus has many uncanny characteristics. In the dark it glows with an unearthly greenish luminescence; in the air it ignites spontaneously. And it is an extremely strong poison. Years ago, before we became aware of its dangers to the public health, it was used as an ingredient of matches and rat poisons. But the phosphorus in our bodies is not present in the pure form; it is in phosphate compounds.

Scarcely any of our vital processes take place without phosphorus. It occurs in the protoplasm and nucleus of every cell. It also enters into the formation of the body's complex protein and fat compounds, as well as the plasma and other body fluids. About two pounds of this mineral are needed to fill the body's requirements.

Generally, a diet adequate in calcium will also be adequate in phosphorus. The reputation of fish as a brain food rests on its phosphorus content, but there is no evidence that sea food perks up sluggish mentalities or raises lagging intelligence.

Iodine, the regulator.

No mineral shortage shows up quite so specutacularly as does that of iodine. Practically every molecule of it is greedily snatched from the blood stream by the thyroid gland to use in the powerful thyroid hormone known as thyroxin.

This hormone governs the tempo of every chemical process by which we live. Too much of it plays havoc with the co-ordinated working of vital organs. For instance, an abnormal secretion of thyroxin causes the heart to beat at an alarmingly rapid rate. Uncontrollable nervousness and restlessness also develop. On the other hand, if too little thyroxin is produced a person becomes mentally and physically sluggish.

Thyroid substance is one of the most potent materials known to medical science, and it should never be used for any purpose except under the doctor's supervision. This is particularly true in connection with weight reduction. While thyroid extract will cause rapid weight loss, it may also lead to serious disturbance at the same time.

The most common symptom of iodine deficiency is an enlargement of the thyroid, or simple goiter. In its mild form this condition is not too serious, but if the swelling progresses too far, it may cause harmful effects. It may also turn into myxedema, a form of thyroid disturbance that retards all body activities.

Simple goiter has been called " the cheapest and easiest of all diseases to cure or prevent ". Doses of iodine are so effective that thyroid enlargement usually subsides rapidly. Prevention is even simpler. This calls only for the regular use of iodized table salt.

The amount of iodine which we require is unbelievably small. A quantity equivalent in size to a grain of wheat will keep the thyroid functioning normally for a year Sea foods and vegetables grown in sea-coast soils are the principal natural sources of this mineral.

"Please pass the salt."

Salt does far more than merely satisfy our taste buds. This mineral occurs in the body as a compound of sodium and chlorine, and it is an essential constituent of blood and other body fluids.

There has been a lot of talk about the dangers of overdoing our " Salt-shaker habit ". We use a great deal of salt, averaging about six pounds per person each year. But most authorities agree that larger amounts of salt do us no harm as any excess of it is rapidly excreted through the kidneys. Of course, in certain kidney disorders, salt intake may be restricted to relieve the burden on these organs.

Generally we get all the salt we need, but it is wise to increase slightly the normal intake of salt whenever sweating is greatly increased by long strenuous exercise or by very hot weather.

The Rarer minerals.

Your body is not likely to send out an SOS for silicon, zinc and other rare substances, the merest amounts of which occur in our mineral make-up. But since they have some strange and unusual functions, they are worth noting briefly.

Manganese is believed to be necessary to the proper use of thiamine, vitamin B-1. Magnesium, that familiar chemical which flares so brightly for the photographer, apparently enters into combination with calcium to regulate the action of the heart. It may also help in converting food into energy.

Other rare minerals in the body are sulfur, which combines with certain amino acids to form our tissue " building blocks," and which keeps the hair and nails healthy; bromine, which is thought to be necessary to the work of the adrenal glands, and possibly plays a part in helping us to fall asleep; cobalt, which stimulates blood formation; zinc, which possibly has a regulatory function similar to that of copper; silicon, which keeps the skin elastic; fluorine, which hardens the enamel of teeth; arsenic, which probably has something to do with the growth of hair, and pottassium.

Make the most of minerals.

Now that you know how important the minerals are to your health, you will certainly want to make the most of them. Here are a few hints to help you to get the full mineral value from your food.

Prepare foods carefully. Many minerals are lost in your own kitchen—by scalding, parboiling, peeling, scraping, shredding and soaking foods in cold water until cooking time. These practices led someone to remark that the kitchen sink is the best nourished " member " of the family! Remember that cooking water holds the minerals and it should be used either in sauces or soups.

Methods of cooking are equally important. The longer the cooking time, the greater the loss of minerals—especially in boiling. Pressure cooking, since it is quick and requires little water, is the best way to preserve the minerals of many foods, particularly vegetables. Canned foods, incidentally, are often better sources of minerals than fresh foods improperly prepared. This is because canned foods are cooked after being put in the can and sealed. Consequently, the minerals are retained in the food or juice. The mineral content of frozen foods and of those stored at low temperature is also retained.

In summary, then, the minerals are just as important in your diet as vitamins. You will most likely get enough of them if you *plan your meals around a wide variety of nutritious foods.* These include meat or fish or eggs, milk and milk products, fresh fruits including one of the citurs group, nuts green and yellow vegetables, butter or margarine and whole-grain or enriched breads and cereals. Eat them in sufficient amounts for body upkeep and repair and to keep your weight normal throughout life.

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